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SUPPLEMENTARY SYSTEM OF NUTRIENT ARTERIES FOR THE LUNGS.

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IT is a well-known fact in anatomy, that each lung has, in addition to the pulmonary artery conveying venous blood, one or two small nutrient arteries passing to it. These vessels, called bronchial arteries, are derived, as a rule, either from the thoracic aorta, or in part from that vessel and in part from its upper intercostal branches. In this communication I wish to show that these usually described bronchial arteries are not the only nutrient vessels of the lung, but that it receives, in addition, a number of slender supplementary nutrient arteries from other quarters.

If the systemic arterial arrangements in the cavity of a healthy thorax be carefully injected with size and vermillion, or other colouring matter, and the pleural cavities then opened by removing portions of the ribs, and muscles attached to them, the general distribution of the arteries in the thoracic walls may be examined without difficulty. The vessels to which I wish more particularly to direct attention are the internal mammary arteries and the trunks of the thoracic intercostals, as they lie in relation to the bodies of the dorsal vertebrae. From each internal mammary artery, besides other branches to which I need not now refer, arise sundry small arteries known as pericardiæ and mediastinal branches, and a long branch accompanying the phrenic nerve and passing along with it to the diaphragm.¹ These vessels

¹ The arteria comes nervi phrenici inosculates in the diaphragm with the proper arteries of that muscle. I have now more than once seen cases in which the lower half of this artery was a vessel of considerable size, arising from the diaphragmatic artery and ascending to join the branch from the internal mammary about opposite the root of the lung.

are all situated beneath the mediastinal pleura, and lie therefore between it and the pericardium. They do not, as is implied in the descriptions usually given in anatomical works, end simply in the fibrous bag of the pericardium, in the fat of the mediastinum, the thymus gland and the diaphragm, but they give off, in addition, branches which anastomose and form an arterial plexus, which from its position may conveniently be termed the sub-pleural mediastinal plexus. The general arrangement of this plexus can be examined without using either knife or forceps, by drawing the lung outwards, and observing the slender arteries filled with injection beneath the transparent mediastinal pleura. The arteries are elongated, thread-like vessels, of almost uniform calibre throughout, and the mesh-work which they form by their intercommunication is open and irregular.

If now the lung be raised from its position and thrown forwards, the trunks of the thoracic and superior intercostal arteries may be seen lying in relation to the bodies of the dorsal vertebræ, and from the greater number of them fine arteries arise similar in their characters to those just described. These vessels lie beneath the posterior mediastinal pleura, and supply the fat, areolar tissue, and glands of the posterior mediastinal space, and the hinder part of the pericardium. Those on the right side lie in close relation to the œsophagus, and anastomose with its proper arteries. Those on the left side run forwards in close relation to the outer coat of the descending thoracic aorta. These fine arteries also anastomose with each other, and form the posterior portion of the sub-pleural mediastinal plexus. Above and below the root of the lung they send branches forward which inosculate with the division of the plexus lying in front of that structure. In giving a description therefore of the anastomoses of the internal mammary and intercostal arteries, it is not sufficient to refer merely to those occurring in the diaphragm and costal walls, but the inosculation between the vessels forming the anterior and posterior divisions of the sub-pleural mediastinal plexus must be included.

This plexus is interesting, not only because it serves to afford an additional channel of communication between the arteries of supply for the thoracic wall, but because from it the supplementary system of nutrient arteries for the lungs arises.

In a healthy well-injected thorax, these vessels may be seen without any difficulty, passing to the lung in the following manner:—Some proceed from the anterior division of the sub-pleural mediastinal plexus, and pass in front of the root of the lung, to its inner surface; others from the posterior division of the plexus pass behind the root of the lung, and others reach it by running between the two folds of the pleural membrane, known to descriptive writers as the ligamentum latum pulmonis. Having reached the lung by one or other of these three routes, the fine thread-like arteries are distributed as follows:—Some pass deeply into the root of the lung, and run along with the bronchial tube into its substance; others again, and these apparently the greater

number, are more superficially placed, and may be readily traced beneath the pulmonic pleura for a considerable distance; not unfrequently they accompany those branches of the pulmonic vein which lie near the surface of the lung. From the mode of origin and general distribution of these arteries, there can, I think, be no doubt that they are fine accessory nutrient vessels, and supplement, therefore, the bronchial arteries in their distribution. I am unable to state, with certainty, the exact mode of termination of these vessels in the lung; but from their close analogy to the bronchial arteries in their distribution, it may, I think, safely be assumed that those which pass any distance, either in the substance or on the surface of the lung, assist in the supply of the coats of the air and bloodvessels and the pulmonary connective tissue, and end in the pulmonary system of vessels, either arteries, capillaries, or veins.

The sub-pleural mediastinal arterial plexus from which these vessels arise presents several interesting relations, of which it may not be amiss to say a few words. From the circumstance that, on the one hand, it anastomoses with the arteries which supply the parietes of the thorax, and, on the other, that it is in communication with the vessels of the lung, it serves to place the vessels of the latter in direct communication with the arteries of the wall—a relation the importance of which, with reference to the question of the mode of operation of local bloodletting, will be readily recognised. In a paper published in the 'Medico-Chirurgical Review' for July, 1863, I recorded the results of some observations on the arrangement of the arteries in the abdominal cavity, and I pointed out that there existed in the fat and areolar tissue behind the peritoneum a well-marked arterial plexus, to which I applied the term of sub-peritoneal arterial plexus. Through it, not only are the arteries of one viscous in vascular communication with those of another, but the arteries of the abdominal wall are in communication with the visceral arteries, so that one set of vessels may be injected through the other. The sub-pleural mediastinal plexus now described, so far at least as it affords a medium of communication between the visceral and parietal arteries, has in the thoracic cavity an arrangement closely comparable to that of the subperitoneal plexus in the cavity of the abdomen.¹

I believe that in certain cases of malformation of the heart this sub-pleural plexus would, if carefully examined, be found to have assumed a size and relative importance greater than that which it possesses under ordinary conditions. I refer to those cases in which the pulmonary artery is obliterated, and the ductus arteriosus closed, so that the supply of blood to the lungs is derived from other sources, and

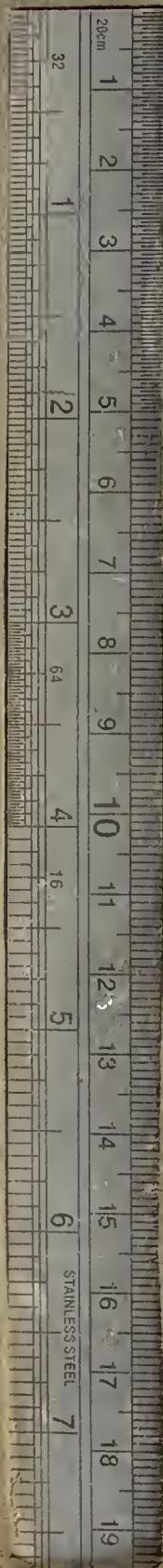
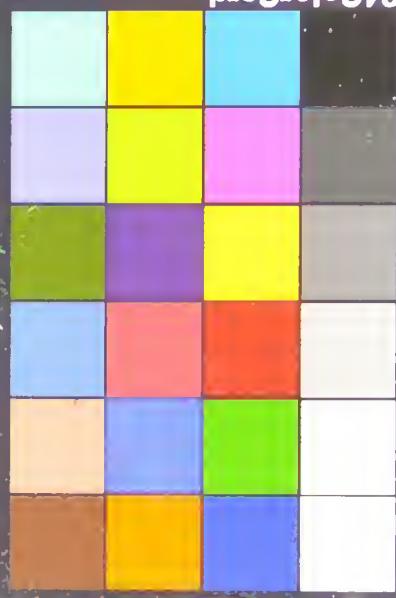
¹ In cases of long-standing pleurisy, in which the inner surface of the lung was firmly united to the mediastinal pleura by old adhesions, I have several times seen branches from the subpleural mediastinal plexus extend along these adhesions to the lung, and ramify for some distance on its thickened pleural surface. The vessels were so large as to be filled by the coarse injection of the dissecting-room.

would suggest that those who may have opportunities of examining cases of this kind should inject this system of vessels.

In conclusion I may state, as a general result of my injections in these and other localities, that though the area or domain appropriated to each artery is, as a rule, clearly defined, yet that where adjacent areas are in contact, the arteries of one almost invariably inosculate with the arteries of another, and, under some conditions, actually encroach upon the domain of another.

THE END.

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